under construction by the Moores Bluff Rice Company. The canal will be 7 or 8 miles long and will irrigate 4,500 acres this year. The machinery to be installed under the supervision of Schlafli and Porter Company will have a capacity of 36,000 gallons per minute and is so designed that the capacity may be doubled or tripled at any time, and the acreage increased accordingly.

The McFadden, Wiss and Kyle Land Company, of Beaumont, Tex., is making extensive improvements to the machinery of its rice canal which is located 6 miles south of Beaumont on the Neches. One new pumping unit, having a capacity of 50,000 gallons per minute, will be added, giving a total capacity of 190,000 gallons per minute, sufficient to irrigate 27,000 acres.

A bond issue of $193,000 was voted upon and carried by the citizens of Alvin, Tex., for the creation of the Alvin Drainage District.

The county commissioners of Harris County, Tex., acted favorably upon petitions for the creation of Drainage District No. 4, which will cover the southeastern portion of that county.

SNOWFALL IN THE MOUNTAINS.

The following reports of the snowfall in the mountain districts of the Rio Grande and Rio Pecos watersheds have been furnished by the section directors of the Colorado and New Mexico sections.

Report of Mr. F. H. Brandenburg, Section Director, Colorado Section:

The snowfall for January was much less than for the corresponding month a year ago. As compared with the normal, the deficiency, as a whole, was not so marked; in localities the deficiency was considerable, while in others there was a slight excess. The warm spell at the beginning of the month caused a general settling of the snow, and some melting. With the return to normal temperature conditions, much of the old snow was solidly frozen—a condition favorable to late melting. In localities exposed to the prevailing strong winds, the current fall was carried to the gulches and sheltered spots, forming numerous drifts. The depths will doubtless be materially increased by the later snowfalls, which, as a rule, furnish the water for the early part of the irrigation season; the present depths, however, have a bearing on the flow of midsummer, after the snows of spring have disappeared.

Report of Mr. C. E. Linney, Section Director, New Mexico Section:

The snowfall during January was light and generally confined to the mountain districts. General rains on the first few days of the month and on the 16th and 17th caused rapid melting and solidifying, and in most districts the remaining snow, which is still above the normal amount, was compact and crusted and almost solid ice. In the higher altitudes the snow in the canyons and on the north slopes was in deep drifts, varying in depth from 5 to 20 feet or more, and, with the exception of the lower Pecos Valley and the extreme southwest, the reports state that at the close of the month the prospects for a sufficient water supply for irrigation were very encouraging.

WORK UNDERTAKEN AT THE FREMONT FOREST EXPERIMENT STATION IN CLIMATOLOGY AND FORESTRY.

By L. H. DAINGERFIELD, Local Forecaster, Pueblo, Colo.

The more general relations of meteorology to forestry have long been known, but the more specific adaptations remain in the experimental stage. It is for the careful study of the special relations as well as the general that the meteorological equipment of the Fremont Experiment Station is being used. This station is situated on Rock Creek, about one mile from the mountain terminal of the Mount Manitou Incline Railway, Manitou, Colo., and is reached after leaving the railway terminal by following the windings of a picturesque burro trail. The main building, office, and laboratory are situated on the eastern end of Muskoko ridge, occupying the floor of the beautiful valley, 8,850 feet (approximately) above the sea. On each side of the valley the mountains rise 1,000 or 1,500 feet laden with yellow pine, Engelmann spruce, Douglas fir, aspen, etc. Eighty acres of this valley land and the mountain slopes are reserved for experiment purposes.

The instrumental equipment of the station is placed on 3 solid wooden towers, known as stations Nos. 1, 2, and 3. These towers are 16 feet in height from their several platform centers to the ground; the platforms are 5 feet square bounded by railings about 2½ feet in height. Station No. 1 is located on Muskoko ridge about 150 feet west of the office quarters and carries an instrument shelter on the southwest corner of the platform railing, in which maximum and minimum thermometers and a sling psychrometer are placed. A combined wind vane and anemometer stand extends up through the northwest corner of the platform. The base of the stand is securely bolted to a large cedar post about 3 feet in height, and the combined rain and snow gage occupies its iron tripod which is securely fastened to the northeast corner of the platform railing. The average height of the instruments above the ground is about 20 feet. The tipping bucket rain gage is about 30 feet west of Station No. 1. A sunshine recorder is operating on top of the Station No. 1 instrument shelter. The anemometer, wind vane, sunshine recorder, and tipping bucket rain gage are all connected with the triple register operating in the station quarters.

Station No. 2 is situated on a south slope of 15° to 20°, about 600 feet northwest of the station quarters, in an open stand of yellow pine trees. It carries an instrument shelter (containing maximum and minimum thermometers and a sling psychrometer), an anemometer on a wooden support without wire connections, and an ordinary rain and snow gage, similarly located as on tower of Station No. 1.

Station No. 3 is situated on a north slope of 25° to 30°, about 700 feet to the west of the station quarters, in a rather close stand of Engelmann spruce. Its equipment is the same as that of Station No. 2, with similar exposure of the instruments.

Observations of all instruments at all three stations are made at 7:00 a. m., anemometer dials read, and maximum and minimum thermometers set daily. Observations of maximum and minimum thermometers and dry and wet thermometers are also made at Station No. 1 at 1:00 and 7:00 p. m., daily. Observations are also taken at other hours when peculiar or unusual conditions exist.

A full record of the sunshine is impossible on account of the horizon line being broken by mountains, except a short space in the east; during the midwinter months the forenoon sunshine record may be complete.

In addition to the present Weather Bureau equipment at the experiment station, soil thermometers are to be installed in iron tubes sunk from 1 to 2 feet deep at each station. The bulbs of the several thermometers will be inserted in corks slightly smaller than the tubes. This will prevent too rapid a change in temperature when the thermometers are removed from the iron tubes to be read, and, at the same time, will not interfere with the action of the slow-changing soil temperature on the thermometers. The soil thermometers at depths of 1 to 2 feet are expected to measure the true temperature of the soil zone where most of the tree roots are found. As the research work of the station is principally concerned with those factors which affect forest trees, all instruments for measuring atmospheric factors are exposed on towers about 20 feet above ground, where they will feel the average temperature, wind, etc., in the same atmospheric level as the tree crowns.

Snow scales are to be installed at all three stations to supplement the ordinary rain and snow gage readings. The average depth of the snow and the water coefficient will be determined; and the melting, settling, and evaporation of the snow will also be considered.

The exposure of the instrumental equipment in three distinctly different locations is rendered necessary in the study of three distinct forest types prevailing around Fremont station. The study is expected to explain, at least partly, the climatic requirements of the several tree species of this part of the Rocky

Mountains; to determine the character of climate which fixes the differing types; to show the conditions which affect the health of trees, which in their worst forms cause winter killing; to obtain a record of the climatic factors which influence experiments on different types at the station, such as selective experiments with the introduction of exotics, the activity of insect pests, etc. A knowledge of the situation and species aids in determining permanent types, extending the range of native species, and in introducing new trees in an intelligent manner. It is known that yellow pines are tolerant to warmth and dryness (relatively speaking), hence are found in this latitude at altitudes of from 6,000 to 9,000 feet; Engelmann spruce is tolerant to a wet, cold climate, and is therefore found in the high levels of from 9,000 to 11,500 feet; Douglas fir is medium in its habits and is found at altitudes ranging from 8,000 to 10,000 feet. Systematic study may extend this list indefinitely.

One of the general objects of the study at Fremont station with its meteorological instruments in diverse exposures is to compare the several climatic factors on opposing slopes to determine their effect on the character of stand of forest trees and their rate of growth. It is known that, in general, the north slopes, in this region, are moister than the southern, and, although colder than the opposite slopes, bear excellent forests, while the southern slope forests are inclined to be somewhat inferior.

With the introduction of the meteorological equipment at Fremont station a study of the climatological œcological factors may well receive special attention. A study of the water supply is essential, but observations of the seasonal fall, the character of that fall as to rain or snow, and sudden deluges interspersed with droughts, or more even distribution, are more essential. To notice the mean annual temperature is of importance, but observations of the mean seasonal or monthly temperature and the extremes are more important. Likewise consideration of the average wind movement for hours, days, months, and years is necessary, but the consideration of the seasonal distribution of the low and high wind movements and the frequency of destructive gales is more necessary. Observation of the sunshine factor is useful, but its observation during the months of growth is more useful, and the same is true of vapor deficit as affecting transpiration and evaporation. In this connection, it is worth while noting that a study of the several œcological factors can not be successfully accomplished without combining the study of the several factors.

Very little has been accomplished in the study of meteorology by direct observation at Fremont station, owing to the fact that the equipment has been but recently installed. The accomplishment of much good is confidently expected, and the solution of forest problems, either partly solved or wholly unsolved, may result from the work so recently inaugurated.

It is worth while noting one phenomenon which occurred during the closing day of the old year: On December 31, 1909, a violent west wind (chinook) occurred with an attending high temperature; the average wind movement, obtained from dial readings, noon to midnight of date mentioned, was 70 miles per hour. On January 11, 1910, all of the yellow pines on the south slope showed the desiccating effect of the gale and high temperature of December 31—all last season's needles were turning lemon yellow in color, while other tree species were unaffected. Such observations are useful as an aid in the introduction of species better adapted to the climatic conditions of that locality, and this study may be indefinitely expanded.

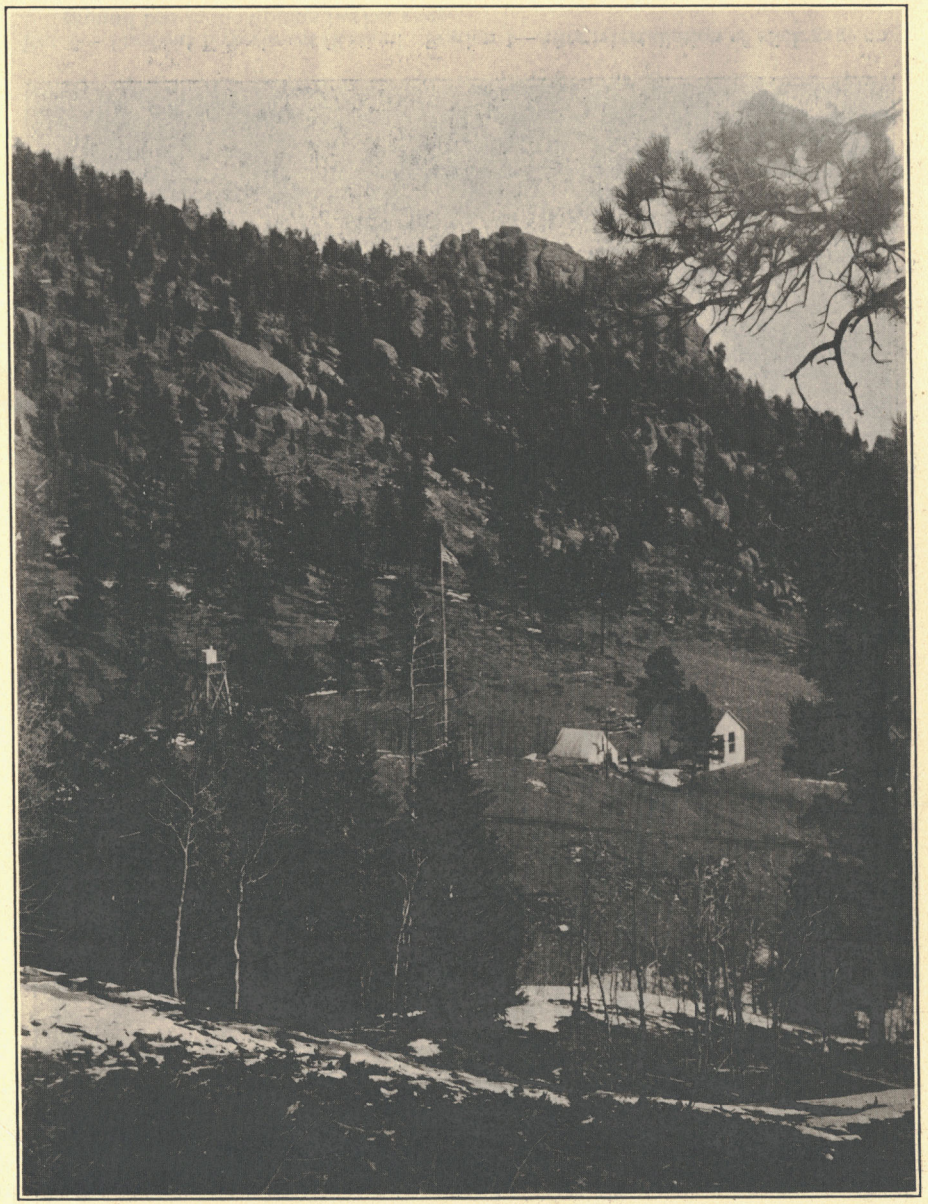

FIG. 1.—Fremont Experiment Station. Station 1 and living quarters, looking toward the northeast and east.

FIG. 2.—Fremont Experiment Station. Station 1—Situated on top of Muskoko ridge which occupies the valley between the south and north slopes upon which stations 2 and 3 are situated. The standard stick gage has been removed from the tower since this view was taken. [See fig. 3.]

FIG. 4.—Fremont Experiment Station. Station 2—Situated in an open stand of yellow pine on the south slope. The ordinary rain and snow gage here is installed on the ground, but is not shown in the photogrhph.

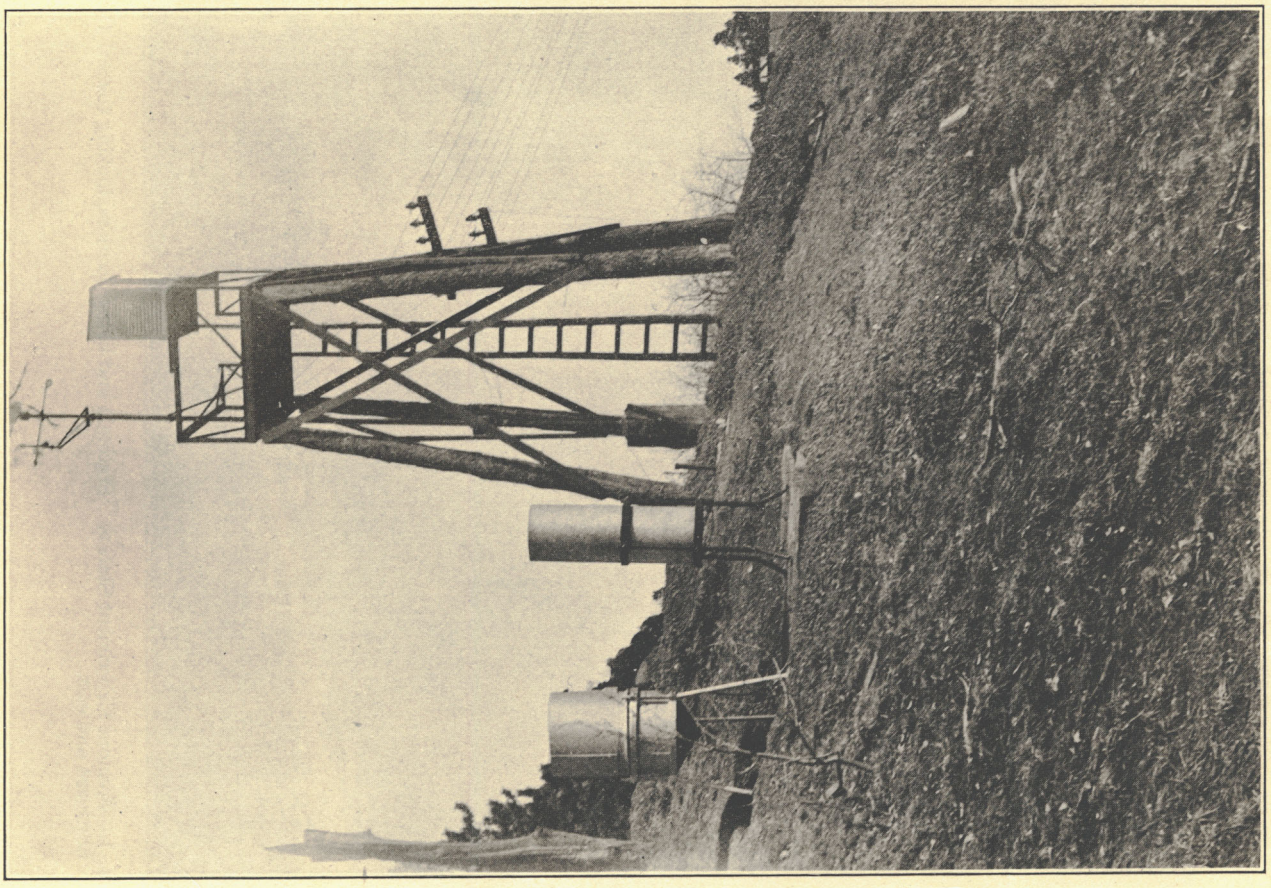

FIG. 3.—Fremont Experiment Station. Station 1—After reinstallation of stick gage on ground beside the tipping bucket gage.

FIG. 5.—Fremont Experiment Station. Station 3—In a close stand of Engelmann spruce on a north slope.